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TITLE: Method and device for
extracting principal image
                      subjects

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Detailed Description Text - DETX (31):
   The **skin color**/circular shape extracting section
78 performs **skin color** and
circular shape extractions to **extract the face
region** as the principal part of
an image. Stated more specifically, the **skin
color**/circular shape extracting

section 78 detects the hues and saturations of individual pixels from the
prescanned data (the data may optionally be thinned out) and **extracts a region**
of pixels (a **skin color region) that are estimated to represent a skin color**
corresponding to the human skin. Human faces are generally elliptical so the
skin color/circular shape extracting section 78 then bases on the **extracted**
skin color region to extract an elliptical or circular shape that is estimated
to represent the human face and designates it as a candidate face region.

Detailed Description Text - DETX (36):
    The synthesis/result evaluating section 82 synthesizes the candidate face
regions extracted with the skin color/circular shape extracting section 78 and
the face contour/circular shape extracting section 80 and checks from the
composite (candidate) face region to see if the result of face extractions is
appropriate or not.

Detailed Description Text - DETX (38):
    One method of evaluation to be performed by the synthesis/result evaluating
section 82 is shown in FIG. 5. The area of region C which is an overlap
between the **region A extracted by the skin color**/circular shape **extracting**
section 78 and the region B extracted by the face contour/circular shape
extracting section 80 is determined; if both area ratios C/A and C/B exceed a
specified threshold (Th), the result of face

extractions is found to be
appropriate; otherwise, the result is found not
appropriate.

Detailed Description Text - DETX (39):
   Another method of evaluation to be performed
with the synthesis/result
evaluating section 82 is by weighting the **extracted
regions by reliability
depending upon the method of extraction** or the like
and evaluating the total
weighted scores. Referring again to FIG. 5, each
of the pixels in the **region A
extracted with the skin color**/circular shape
extracting section 78 is weighted
by a score of one, each of the pixels in the **region
B extracted** with the face
contour/circular shape extracting section 80 is
weighted by a score of two, and
each of the pixels in the region C which is an
overlap between the two regions
is weighted by a score of three and the total
weighted scores are calculated
for the three regions A, B and C; if they exceed a
certain threshold, the
result of face extractions is found to be
appropriate; otherwise, the result is
found not appropriate.

Detailed Description Text - DETX (41):
   The criteria (thresholds in the case described
above) for evaluating the
result of face extractions in the synthesis/result
evaluating section 82 may be
changed depending on the need. Consider, for
example, a close-up of the human
face and other images that are believed to be
occupied by an extensive area of

a principal part (which may be evaluated by the aforementioned area of **skin color**) or a scene shot with an electronic flash; in order to reproduce high-quality images, face extraction is preferably performed with high precision and, hence, more strict criteria for evaluation may be adopted. Alternatively, criteria for evaluation may be varied stepwise depending on the area of **skin color** and the like. Conversely, in the case of ordinary portraits and the like, the face **region to be extracted** may drop if too strict criteria are adopted; to avoid this problem, less strict criteria may be adopted.

Detailed Description Text - DETX (43):
    If the result of extraction is found to be appropriate in the synthesis/result evaluating section 82, the composite face region (or the information about it) is sent to the principal part identifying section 88 so that the principal part of the image is identified. The method of identifying the principal image part (the principal image subject) in the principal part identifying section 88 is not limited in any particular way. In one exemplary method, all **regions extracted in the skin color**/circular shape extracting section 78 and the face contour/circular shape extracting section 80 may be identified as the principal part. Alternatively, an overlap between the results of extraction in the two sections may be identified as the principal part.

Detailed Description Text - DETX (80):
    In the extracting site 72A shown in FIG. 4, the condition evaluating section
can be exemplified by the synthesis/result evaluating section 82 which
synthesizes candidate subjects having different characteristics as extracted in
the **skin color**/circular shape extracting section 78 and the face
contour/circular shape extracting section 80 served as a plurality of
extracting subunits processed in parallel, and which judges whether the results
of the subject **extraction are appropriate or not on the basis of the extracting**
regions of the synthesized candidate subjects, and the principal part
identifying section 88 for finally identifying the principal part of the image
or the principal image subjects. The principal part identifying section 88 can
be an example of the condition evaluating section in the last extracting unit
92 which has no extracting subunits.

Detailed Description Text - DETX (84):
    The setting site 72B of the setup subsection 72 reads the prescanned data
from the prescan memory 52, and on the basis of the acquired prescanned data,
constructs density **histograms** and calculates image characteristic quantities
such as **average** density, highlights (minimum density) and shadows (maximum
density) to determine the reading conditions for fine scan; in addition to the
density **histograms** and the image characteristic

quantities, the setting site
72B is based on the principal part of the image
extracted by the extracting
site 72A and responds to an optionally entered
operator command or the like,
thereby constructing LUTs for performing gray
balance adjustment, tonal
correction and density adjustment, constructing MTX
operational formulae for
performing saturation correction, calculating
coefficients for sharpness
correction and the otherwise setting conditions for
the various image
processing schemes and steps to be implemented in
the prescanned image
processing section 56 and the fine scanned image
processing section 58.

Detailed Description Text - DETX (94):
    In the extracting site 72A, the method for
extracting principal image
subjects according to the first aspect of the
invention is performed in the
manner already described above. Stated more
specifically, a face candidate
**region is extracted in each of the skin
color**/circular shape extracting section
78 and the face contour/circular shape **extracting
section 80; the candidate
face regions extracted** in the two sections are
assembled in the
synthesis/result evaluating section 82 and the
result of extractions is
evaluated; if the result is appropriate, the
switching section 84 connects to
the principal part identifying section 88, where
the principal part is
identified and the information on the identified
principal part is sent to the

setting site 72B. If, on the other hand, the result of extractions is found
not appropriate in the synthesis/result evaluating section 82, the switching
section 84 connects to the body/eye extracting section 86, which is supplied
with the result of synthesis and relevant image data to perform an additional
face extraction using body and eye extractions; the result of extraction is
sent to the principal part identifying section 88, where the principal part is
identified and the information on the identified principal part is sent to the
setting site 72B.

Detailed Description Text - DETX (110):
   While the methods of extracting principal image subjects to be executed in
the invention are not limited in any particular way, the following six
extractions may be performed in the illustrated extracting site 72A: face
extraction by **skin color**/circular shape extraction; face extraction by face
contour/circular shape extraction; face extraction by body/circular shape
extraction; face extraction by eye (face's interior structure)/circular shape
extraction; face extraction by hairs on head/circular shape extraction; and
background extraction. For details of these methods of extracting image
subjects, reference may be had to the patents already listed above. To
summarize: i) **skin color/circular shape extraction involves skin color** and
circular shape extractions to **extract the face region**; ii) face

contour/circular shape extraction involves both extracting the face contour by edge extraction and **extracting a circular shape to extract the face region;**
iii) body/circular shape extraction involves both extracting the body contour by edge extraction and **extracting a circular shape to extract the face region;**
iv) eye/circular shape extraction involves both extracting human eyes and a circular shape to **extract the face region**; v) hairs on head/circular shape extraction involves both extracting the hairs on the head by edge extraction and **extracting a circular shape to extract the face region; and vi) background extraction** uses contour extraction to extract the background behind human individuals, thereby acquiring auxiliary information such as for face extraction.

Detailed Description Text - DETX (123):
    The similarity between two images may be evaluated in terms of at least one image characteristic quantity selected from among the **average** density by region of about six divisions of the image, the shape of a density **histogram** (as exemplified by the peak position), density distribution, highlight (minimal density), shadow (maximal density), **average** density and so forth.